

Roads and biosafety:

Risk of airborne transmission of pathogens from livestock transport trucks to farms

Miquel Ros Àvila - June 2018

INTRODUCTION

Airborne transmission of infectious diseases, although not very common, is possible and it is difficult to be prevented and controlled. Simulation models of air particle distribution helps to anticipate the areas that are in risk of being affected.

It is unknown how airborne viruses are transported, however there are evidences that they are moved in groups and joined together in droplet nucleus. Droplet nucleus are suspended and randomly distributed in the air.

GOAL

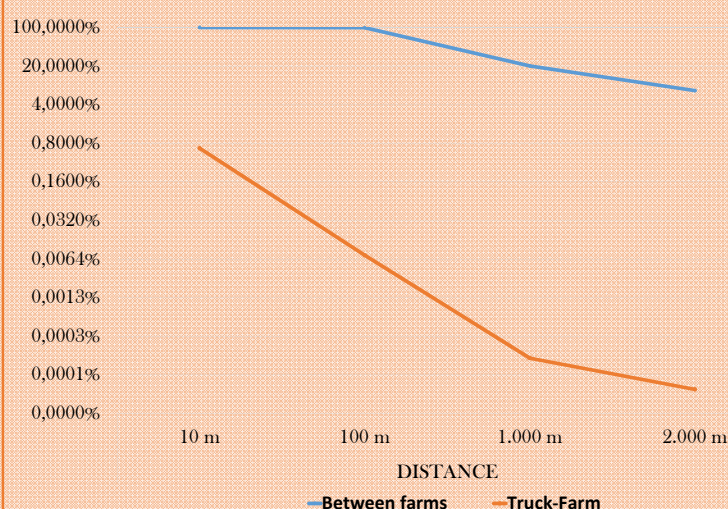
- Evaluate the risk posed by the possible airborne transmission of pathogens from a livestock transport truck that circulates along a road to a farm located close to the road.
- Evaluate the relevance of the distance between the source of the virus and the farm, the number of animals that can transmit the virus and the number of animals susceptible to get infected

MATERIAL AND METHODS

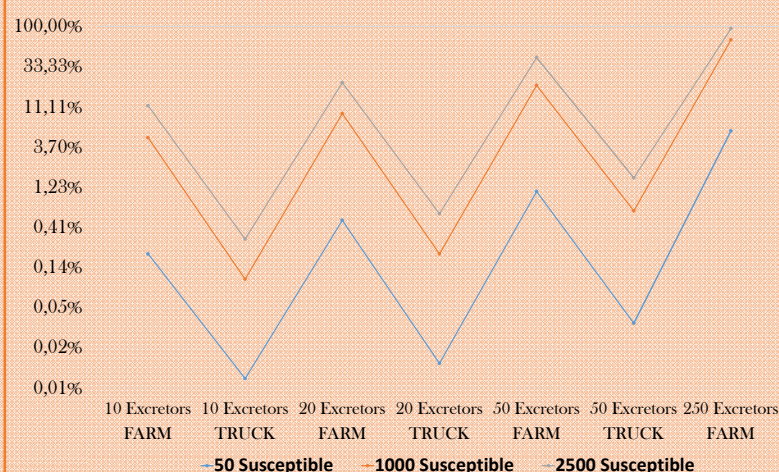
Software	ALOHA (From NOAA)
Conditions considered for the simulation:	
Chemical component	Ethane
RH	99%
Temperature	20°C
Wind speed	35 Km/h
Topography	Open country
Viric excretion	4x10 ³ TCID ₅₀
Minimal dose infection	10 ³ TCID ₅₀
Distance	10, 100, 1.000, 2.000m
Susceptible animals	50, 1.000, 2.500 animals
Excretory animals	10, 20, 50, 250 animals
	10, 20, 50 animals
Excretion time	5 hours
	4,5 seconds

RESULTS

Infection probability for a farm, based on distance and comparing a truck and a farm as a source of virus



Infection probability for a farm, based on number of excretory animals, susceptible animals and type of excretory source.



CONCLUSIONS

- The risk that supposes a truck circulating by a road implies a risk between 154 and 257,000 times lower than the risk that would suppose a farm located at the same distance.
- The increase of the distance between the source of the virus and the recipient farm produces a rapid decrease of the likelihood of infection.
- The risk is directly proportional to the number of animals eliminating the virus and to the number of susceptible animals in the recipient farm.
- The risk of a farm getting infected is more depending on the number of animals eliminating the virus than on the number of animals susceptible to become infected in the recipient farm.